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FROM: Woody Myers - WCR / SUBJECT: Mercer Sanitary District No 1 - Land Disposal System Evaluation Report,
WPDES Permit # WI-0029602**Effluent & Groundwater Evaluation Summary****Table 1 Effluent Parameters and Limits**

Parameter	Current Permit WI-0029602-10		Proposed Permit WI-0029602-11	
	Limits and Units	Limit Type	Limits and Units	Limit Type
Flow Rate	- MGD		- MGD	
BOD ₅	50 mg/l	Monthly Avg	50 mg/l	Monthly Avg
Total Suspended Solids	- mg/l		- mg/l	
pH, Field	- su		- su	
Kjeldahl Nitrogen	- mg/l		- mg/l	
Nitrite + Nitrate as N	- mg/l		- mg/l	
Ammonia	- mg/l		- mg/l	
Organic Nitrogen	- mg/l		- mg/l	
Total Dissolved Solids	- mg/l		- mg/l	
Chloride	250 mg/l	Monthly Avg	250 mg/l	Monthly Avg
Total Nitrogen	10 mg/l	Monthly Avg	10 mg/l	Monthly Avg

No Recommended changes from previous permit

The effluent parameters and limits are recommended based on the need to evaluate the land treatment system. They should be incorporated into the needs of the compliance staff and not in place of their needs.

Table 2 Monitoring Wells

Well	Current Permit WI-0029602-10		Proposed Permit WI-0029602-11	
	Well Location	Well Designation	Well Location	Well Designation
802 MW-2	Up-gradient	Background	*Side-gradient	Non-Point of Standard
805 MW-5	Down-gradient	Non-Point of Standard	Down-gradient	Non-Point of Standard
806 MW-6	Down-gradient	Non-Point of Standard	Down-gradient	Non-Point of Standard
808 MW-8	Not Installed		*Up-gradient	Background

* Recommended changes from previous permit

Table 3 Groundwater Standards

Parameter	Current Permit WI-0029602-10		Proposed WI-0029602-11	
	PAL	ES	PAL	ES
Depth to Groundwater	N/A	N/A	N/A	N/A
Groundwater Elevation	N/A	N/A	N/A	N/A
Nitrogen, Nitrite + Nitrate	2.0 mg/l	10.0 mg/l	2.0 mg/l	10.0 mg/l
Chloride	125 mg/l	250 mg/l	125 mg/l	250 mg/l
Total Dissolved Solids	410 mg/l	N/A	410 mg/l	N/A
pH	4.9-6.9 su	N/A	4.9-6.9 su	N/A
Nitrogen, Ammonia	0.97 mg/l	9.7 mg/l	0.97 mg/l	9.7 mg/l
Nitrogen, Organic	2.1 mg/l	N/A	2.1 mg/l	N/A
Nitrogen Total Kjeldahl	N/A	N/A	N/A	N/A
Alkalinity as CaCO ₃	130 mg/l	N/A	*Discontinue	
Hardness as CaCO ₃	190 mg/l	N/A	*Discontinue	

* Recommended changes from previous permit

Site Information

Mercer Sanitary District No. 1 is a municipal wastewater treatment facility located at 4651 Feirick Road, Mercer, Iron County. Wastewater is currently treated via sequencing batch reactors and is discharged to groundwater via absorption ponds (seepage cells) located in the NE ¼ of the SE ¼ of Section 1, T42N, R03E, Town of Mercer.

Geology

The bedrock under this facility consists of a complex of metasedimentary rocks with interbedded metavolcanics. The meta sedimentary rocks include meta-argillite, meta-siltstone, quartzite and meta-greywacke (*Bedrock Geologic Map of Wisconsin*, Wisconsin Geological and Natural History Survey (WGNHS), 1982). Bedrock is anticipated to be between 50 and 100 feet below ground surface (bgs) (*Depth to Bedrock in Wisconsin*, WGNHS, 1973). The regolith consists of material ranging from coarse sand to silt. Surface soil primarily consists of the Padus sandy loam (USDA Web Soil Survey).

Hydrogeology

Calculated groundwater elevation ranges between 1593 and 1597 feet above mean sea level (msl). Depth to groundwater was reported to be between 14 and 24 feet bgs. Groundwater flow direction was calculated with some variation. Frequently the flow direction was to the southwest but found to be erratic due to a flat piezometric surface. Regional groundwater is to the southwest in this area of Iron County (*Mean Elevation of Water Table*, United States Geological Survey, 1968). The site is 3,900 feet south of Mercer Lake.

A review of known wells was performed as a part of this evaluation. These wells include municipal, other than municipal, private and high-capacity wells. There is 1 private well within a 1,500-foot range of this facility's groundwater discharge.

Hydraulic and Nitrogen Loading Rates

There are two active outfalls at this facility. Outfall 002 is the discharge associated with the groundwater monitoring network.

Table 4 Sampling Points/Outfalls

Sampling Point (Outfall) Listed in SWAMP		
Number	Outfall Type	Description
Outfall 701	Influent	Influent
Outfall 002	Land Disposal	Effluent, sand filters

The following table is the average flow (hydraulic loading), total nitrogen and chloride loading summations for the Land Treatment System.

Table 5 Land Treatment Disposal Loading Averages

Year	Flow (MGD)	Nitrogen (mg/l)	Chloride (mg/l)
2021*	0.038	15.5	95
2020	0.040	8.0	89
2019	0.046	4.8	101
2018	0.042	6.8	103
2017	0.040	9.9	105
2016	0.040	8.1	163

* Indicates partial year

Groundwater Monitoring Network and Frequency

Groundwater samples were to be collected quarterly from three wells. Well 802 was designated as a background well and was used to calculate Preventative Action Limits (PAL) and Alternate Concentration Limits (ACL) in the previous permit. No wells were designated and sampled as "Point of Standard Application" wells.

Table 6 Groundwater Monitoring Well Data

Sample Point	Well Name	Elevation (feet above msl)					Well Type
		Casing Top	Ground Surface	Screen Top	Screen Bottom	Screen Length	
802	MW-2	1617.66	16.14.4		1587.1		WT
805	MW-5	1611.20	1608.2		1581.6		WT
806	MW-6	1617.5	1614.5		1584.7		WT

All measurements in feet

WT-Water table Observation P-Piezometer O-Other

The groundwater samples were analyzed for the following parameters: Nitrite + Nitrate, Chloride, Total Kjeldahl Nitrogen, Ammonia, Organic Nitrogen, pH, Total Dissolved Solids (TDS), alkalinity and hardness. All of these parameters are analyzed for the aqueous or dissolved phase in groundwater. Established groundwater quality standards are found in s. NR140.10 Table 1 Public Health Groundwater Quality Standards, and NR140.12 Table 2 Public Welfare Groundwater Standards. The thresholds of these standards are the Enforcement Standard (ES) and the PAL.

Groundwater Conditions and Exceedances

Groundwater sampling results from this facility have been analyzed for each well to evaluate trends of regulated compounds in groundwater and to calculate PALs and ACLs where appropriate. The groundwater was evaluated by looking at approximately five years of monitoring results. PALs and ACLs are calculated from this time range.

The only exceedances of groundwater quality standards/limits were of nitrite + nitrate and there was one exceedance of TDS in one well. There were no ES exceedances during the previous permit term.

The trends for nitrite + nitrate appear to be increasing in well 806. A trend was established using a “best-fit” line with a slope intercept equation. The slope is small, but positive meaning the concentration appears to be slowly increasing over time. See Figure 1. The nitrite + nitrate trend in 805 is slowly decreasing.

The monitored groundwater exceedances trend summary is as follows:

MW-5 (805)

Nitrogen, Nitrite + Nitrate

0 of 23 samples exceeded the ES

21 of 23 samples exceeded the PAL

maximum: 7.6 mg/l minimum: 1.0 mg/l average: 3.3 mg/l

TDS

1 of 23 samples exceeded the PAL

maximum: 410 mg/l minimum: 120 mg/l average: 285 mg/l

MW-6(806)

Nitrogen, Nitrite + Nitrate

0 of 23 samples exceeded the ES

11 of 23 samples exceeded the PAL

maximum: 5.9 mg/l minimum: 0.3 mg/l average: 1.9 mg/l

Concentrations and trends in the groundwater monitoring data were compared to the loading data for the land treatment system. There is not a clear correlation between the effluent loading levels of nitrite + nitrate effluent and the groundwater monitoring results.

Proposed Groundwater Monitoring Requirements

The groundwater monitoring wells 802, 805, 806 and 808 (once installed) should be sampled quarterly for the parameters in the table below. No groundwater limits were calculated as a part of this groundwater evaluation. No changes will be suggested as to the designation of a well to be sampled as ch. NR140.22 Wis. Admin. Code Point of Standard Application well.

Table 7 Well Sampling Recommendations

Well Name	Sample Point	Sample Frequency	Sample Parameters	Well Designation
802	MW-2	Quarterly	Table 8	*Non-Point of Standard
805	MW-5	Quarterly	Table 8	Non-Point of Standard
806	MW-6	Quarterly	Table 8	Non-Point of Standard
*808	MW-8	Quarterly	Table 8	Background

* Recommended changes from previous permit

Table 8 Proposed Groundwater Standards –Permit WI-0029602-11

Parameter	PAL	ES	Source
Depth to Groundwater	N/A	N/A	Measured
Groundwater Elevation	N/A	N/A	Measured
Nitrogen, Nitrite + Nitrate	2.0 mg/l	10.0 mg/l	Table 1, NR140
Chloride	125 mg/l	250 mg/l	Table 2, NR 140
Total Dissolved Solids	410 mg/l	N/A	Calculated
pH	4.9-6.9 su	N/A	Calculated
Nitrogen, Ammonia	0.97 mg/l	9.7 mg/l	Table 1, NR 140
Nitrogen, Organic	2.1 mg/l	N/A	Calculated
Nitrogen, Total Kjeldahl	N/A	N/A	Measured
Alkalinity as CaCO ₃	*Discontinue		
Hardness as CaCO ₃	*Discontinue		

* Recommended changes from previous permit

Conclusions

The groundwater flow direction was found to be erratic. The elevations appear to be accurate; the variation is due to a shallow gradient/flat piezometric surface. The location of groundwater monitoring well 802 is adjacent and at times slightly down-gradient of the northern portion of absorption pond 1. As a result, the well designation has been change from a up-gradient background well to a side-gradient non-point of standards application well. A new up-gradient background well will need to be installed. Because of the probable influence from the absorption pond on well 802 no new PALs or ACLs will be calculated for this permit term.

The results for nitrate + nitrite had consistent PAL exceedances in wells 805 and 806. These wells are non-point of standards wells ,but they are located so that the department can use them to determine compliance with groundwater quality standards and limits. In addition, the facility is working under a schedule to reduce nitrogen in their effluent. The department views these actions as their ch. NR140.24 response actions. It is assumed that the reduction of nitrogen in the effluent will eventually be observed in the reduction of nitrite + nitrate in the groundwater. However, due to the short distance between the land disposal system and the groundwater monitoring wells the department may require a down-gradient well of greater distance in the future.

It is being recommended to discontinue analyze groundwater samples for alkalinity and hardness for all wells.

Overall, the facility is found to be substantially compliant.

Compliance Schedule Recommendations

A map is required of the land Treatment system per ch. NR141.065 Wis. Admin Code.

“All monitoring well locations shall be reported to the department on a plan map drawn to a specific scale. The map shall indicate structure boundaries, property boundaries, any nearby surface waters and a north arrow. The plan shall show the wells in relation to each other, to property and structure boundaries and to a common reference point on a horizontal grid system. The origin of the grid system shall be located according to latitude and longitude or according to the state plane coordinate system. The exact vertical location of the top of the well casing shall be referenced to the nearest benchmark for the national geodetic survey datum to an accuracy of 0.01 feet. This plan map shall show the exact location of the installed well on a horizontal grid system which is accurate to within 1 foot.”

A groundwater monitoring well needs to be installed. The well should be up-gradient of absorption pond 1 and the distance between the new well and absorption pond be sufficient to ensure there is no influence from the loaded pond. Plans and specs should be submitted to the department for review and approval prior to the well installation. New groundwater monitoring wells require a baseline of sampling to consist of three consecutive months of sampling after installation for the parameters listed in Table 8 of this document.